Renewable and Sustainable Energy Reviews 13 (2009) 1138–1143

Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: www.elsevier.com/locate/rser

RES technology transfer within the new climate regime: A ''helicopter'' view under the CDM

Haris Doukas, Charikleia Karakosta *, John Psarras

National Technical University of Athens, School of Electrical and Computer Engineering, Management & Decision Support Systems Lab (EPU-NTUA), 9 Iroon Polytechniou Street, 15780 Athens, Greece

ARTICLE INFO

Article history:
Received 16 April 2008
Accepted 12 May 2008

Keywords:
Renewable energy
Sustainable development
Clean Development Mechanism
Technology transfer

ABSTRACT

There are several opportunities for Renewable Energy Sources (RES), within the new climate change regime as they meet the two basic conditions to be eligible under the Clean Development Mechanism (CDM). RES contribute to global sustainability through greenhouse gas (GHG) mitigation and, they conform to national priorities by leading to the enhancement of local economic activity, capacities and infrastructure. However, RES knowledge regarding their benefits, needs and priorities is not easily fed into the developing countries' decision-making process, since it is not provided to all relevant stakeholders in a structured and transparent way. The main scope of this paper is an exploratory analysis of five renewable energy options, namely Hydro, Wind, Solar, Geothermal and Ocean energy, in terms of their status in the developed world and their potential and perspectives for deployment in the developing world. Particular emphasis will be laid on the emerging opportunities for sustainable technology transfer under the umbrella of the CDM.

Contents

1. Introduction

In the context of the *Marrakech Accords* of 2001 a decision was adopted on a framework for meaningful and effective actions to enhance the implementation of United Nations Framework Convention on Climate Change (UNFCCC) Article 4.5 [1]. As part of this decision, an expert group on technology transfers was established with the objective of analyzing ways to facilitate the transfer of environmentally sound technologies to developing countries. For instance, the Global Environment Facility (GEF) has been established under the UNFCCC to support climate policy-based technology and knowledge transfers from industrialized to developing countries [2]. The Seventh Conference of the Parties (COP-7) called upon assessments of technology needs in order to determine the mitigation and adaptation technology priorities of developing countries (and countries with economies in transition). Moreover, within the context of the UNFCCC and international development co-operation, programs have been established to support technology transfers to developing countries. In addition, the Kyoto Protocol contains market mechanisms which enable

* Corresponding author. Tel.: +30 210 7722084/83; fax: +30 210 7723550.
E-mail address: chkara@epu.ntua.gr (C. Karakosta).

1364-0321/$ – see front matter
doi:10.1016/j.rser.2008.05.002

industrialized countries to invest in greenhouse gas (GHG) emission reduction projects on the territory of other countries, mainly the Joint Implementation (JI) for industrialized and the Clean Development Mechanism (CDM) for developing.

CDM and JI projects have made significant progress [3], presently, close to 3082 CDM project activities have entered the process of validation (to be carried out by an officially designated entity), or are under consideration by the CDM Executive Board (EB) for registration or have already been registered [4]. When the current pipeline is perceived in terms of number of projects per project type, the share of bi renewable energy projects is over 60%, as it can be seen in Fig. 1.

Indeed, based on domestic, business as usual priorities and needs, countries may choose an energy technology profile that may not be the 'best' in terms of delivering long term sustainability and GHG reductions since renewable technologies are not included or even considered. The CDM could help raise the energy profile of a country towards the first-best level, provided that the host country has in place a well-developed strategy for renewable energy technology implementation under the umbrella of CDM. Moreover, the concept of programmatic CDM came in the forefront recently, aiming to aggregate a number of relatively small emission reduction activities in developing countries, incorporating also small scale Renewable Energy Sources (RES) options, into a larger bundle (or programme). The programme is then prepared and submitted to the CDM EB as a single CDM activity, with one set of methodologies for baseline determination and monitoring of the project performance.

Thus, opportunities exist for RES options [5], within the new climate change regime as they meet the two basic conditions to be eligible for implementation under the CDM: they contribute to global sustainability through GHG mitigation and, they conform to national priorities by leading to the enhancement of local economic activity, capacities and infrastructure [6]. The implementation of renewable options through the CDM is an essential component for the successful implementation of emission reduction plans in the developing world [7].

However, it remains to be seen how important the mechanism has been in terms of stimulating the transfer of renewable energy technologies to developing countries. The adoption of RES options also depends on developing countries institutional capacity for hosting CDM projects and in terms of assessing technological needs and priorities in order to form an integrated long term strategy [8]. The problem that new technologies' knowledge is not easily fed into the countries' decision-making process is evident, especially when there are attempts to set-up a series of ad hoc projects for the purpose of greenhouse gas emission reduction, rather than serving the overall policy objectives of the host countries. This can be achieved when technologies knowledge

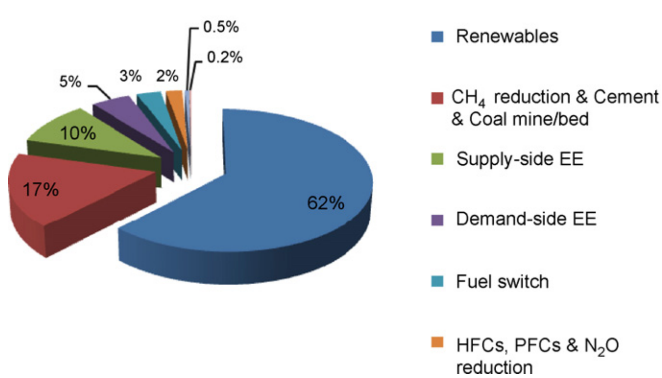

Fig. 1. Number of CDM projects (as of March 2008). *Source:* Fenhann [4].

regarding their benefits, needs and priorities is provided to all relevant stakeholders in a structured and transparent way. The energy policy formulation that incorporates climate change mitigation action, such as RES implementation, in an integrated way, combining national and regional economies enhancement and sustainable development is a key challenge for policy makers today [9].

With respect to the above, the main scope of this paper is an exploratory analysis of five renewable energy options, namely Hydro, Wind, Solar, Geothermal and Ocean energy, in terms of their status in the developed world and their potential and perspectives for deployment in the developing world. Particular emphasis will be laid on the emerging opportunities for sustainable technology transfer under the umbrella of the CDM.

Apart from the introduction, the paper is structured along four sections. Some methodological notes regarding the approach adopted are presented in Section 2. In the following section, based on the presented structure, the corresponding analysis is provided, concerning five particular CDM energy technologies: Hydro, Wind, Solar, Geothermal and Ocean energy, in terms of their status in the developed world, their potential in the developing world and the related perspectives for deployment under the CDM. Finally, the last section is the conclusions, which summarizes the main points that have arisen in this paper.

2. Adopted approach

The approach adopted for the coherent investigation of the options' potential in the developing world and the related perspectives for deployment under the CDM are illustrated in Fig. 2:

In particular, the investigation focused on the following:

Sustainability benefits. Options' specific sustainability benefits are assessed in terms of:

- *Economic benefits*. Energy supply diversification, replicability potential in the country, lower dependency on imported fuels, greater transmission reliability and grid stability, energy price stability, contribution to the country's overall economic development and employment, etc.
- *Environmental benefits*. Improvement of local air conditions, GHG emission reduction, land protection, improved water management, solid waste management, ecological conservation, etc.
- *Social benefits*. Increased socio-economic welfare, poverty alleviation, health improvement, better education, empowerment through training, etc.

Barriers. The options are also examined in terms of the extent their implementation is presently hampered by a number of economic, technical, regulatory and social barriers. Examples of such barriers could be: limited affordability of the technology due to relatively high implementation costs, energy costs and limited availability of local and regional financial resources; the existing domestic legal/institutional framework, especially with a view to existing energy subsidy policies, bureaucracy (e.g. in favor of conventional energy sources), non-transparent decision-making procedures, large-scale state-ownership of enterprises, availability of cheaper but less sustainable alternative technologies; non-transparent investment climate, lack of investment protection, lack of knowledge of technology operation and management as well as limited availability of spare parts and maintenance expertise; negative impact on community social structures, etc.

Perspectives for deployment. The study focus on providing an overall picture of the examined options R&D status, financing

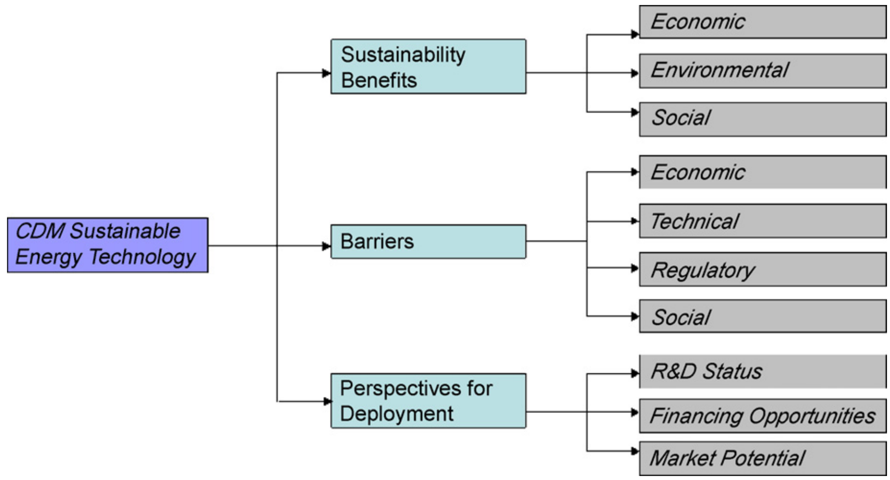

Fig. 2. The adopted approach.

opportunities and market potential in developing countries as well as the rest of the world. The main topic areas that the current R&D activities focus on, the future trends in the R&D field, the existing financial opportunities for the examined technologies in terms of financial incentives, grants, which also influence the implementation of a CDM project as well as the market potential for each option, the allocation of potential for power generation and targets around the world, are identified.

The adopted structure of the issues to be investigated was based on the European Commission (EC) FP6 project ''ENTTRANS: the potential of transferring and implementing sustainable energy technologies through the Clean Development Mechanism of the Kyoto Protocol'' [10], which aims at supporting the host country DNAs in building the capacity to explore which CDM projects would contribute to the countries' sustainable development needs and priorities.

3. Results and discussion

This approach resulted in five particular CDM energy options', namely Hydro (H), Wind (W), Solar (S), Geothermal (G) and Ocean (O) options' coherent descriptions with a view to the new climate change regime and particularly the umbrella of CDM. The main outputs of these descriptions are qualitatively presented in Table 1 and described in the following paragraphs.

3.1. Hydro energy

Developed world. This technology has been in use in Europe for hundreds of years. More than 80% of European Union's (EU) hydraulic capacity is installed in Italy, France, Spain, Germany and Sweden. Current average annual growth rate (2% for the 25 member EU) [11] will bring the EU's installed capacity of small hydro up to approximately 13,000 MW in 2010 [12]. Italy and France with more than 2000 MW are the two countries best equipped with hydraulic installations [13]. An improvement to the economic situation of producers in parallel to environmental constraints decrease is expected to increase the total contribution of small hydropower in the EU 15 member countries to a level that could reach 60 TWh at the decade 2020–2030.

Developing world. Asia, especially China [14], tends to become a leader in hydroelectric generation [15]. Markets such as South America [16] and Africa also possess great, unexploited potential [17]. Great potential also exists in several countries in the world, offering opportunities for a mature European industry to compete in an expanding market [16]. Under current policies, installed capacity of small hydro will increase to 55 GW by 2010 with the largest increase coming from China [18]. In developing countries, hydropower development depends mainly on the economic growth and the increase in energy demand. Asia, especially China [14] and India [19], is affirming itself as the leading continent for

Table 1
Qualitative outputs

		Developed world					Developing world				
		H	W	S	G	O	H	W	S	G	O
1.	Sustainability benefits										
1.1	Economic	++	+	+++	++	+++	+++	+++	+++	+++	+++
1.2	Environmental	++	+++	++	+	++	++	++	+	+	+
1.3	Social	+	++	++	+	+	+++	+++	+++	+++	++
2.	Barriers										
2.1	Economic	++	+	++	++	++	+++	++	+++	+++	+++
2.2	Technical	+	++	+	++	++	++	++	++	++	+++
2.3	Regulatory	+	+	+	+	++	++	++	+++	++	+++
2.4	Social	+	+	+	+	++	+	++	+	++	++
3.	Perspectives for deployment										
3.1	R&D status	+++	+++	++	+++	++	++	++	+	+	+
3.2	Financing opportunities	++	+++	+++	++	+	+	++	++	+	+
3.3	Market potential	+++	+	++	+	+++	+++	++	+++	++	+++

+: low; ++: medium; +++: high.

hydropower, with 83,000 MW scheduled to be installed [12]. By contrast, Africa has only 2000 MW of new installations planned. The economically viable world hydro potential is around 7000 TWh per year, 32% of which already been exploited with 5% devoted to small-scale installations [17].

Perspectives. Large hydroelectric plants face limited difficulties in competing in the energy market with conventional generation, whereas small hydro, especially the very small and the low head plants, can normally only compete in isolated areas or in case of beneficial financing (e.g. soft loans, short pay back periods). Even if small hydro is a proven technology, obtaining financing is often difficult due to the unforeseeable production in the short term and the small scale of projects that could not attract financing with good terms from International Financing Institutions (IFIs). Carbon financing could act as an additional incentive for the further technology deployment. However, only the bundling of activities under big scale programmatic CDM could definitely act as a catalyst for the wide spread implementation of this technology.

3.2. Wind energy

Developed world. All the major wind energy manufacturers have established local manufacturing abroad at various levels or are considering such expansion in emerging markets in South America and Asia [20]. The most successful wind energy markets in recent years have been in Europe, particularly Denmark, Germany and Spain [21]. The fast development of wind power capacity in countries such as Germany and Denmark [22] implies that most of the wind sites with significant potential are, already been exploited. Therefore, any new on-land turbine capacity has to be developed at sites with a marginally lower average wind speed. In the UK, wind energy is the fastest growing energy sector [22].

Developing world. The total available wind resource in the world today that is technically recoverable is 53,000 TWh per year [23]. The global wind energy market is expanding rapidly, creating opportunities for employment as well as upgrading the living standards and the quality of services provided, mainly in remote and isolated areas. A new impulse has also been provided to the use of the technology in many developing countries, including India, China, and South America [24]. Within the next decade, the Philippines hope to become the leading wind power producer in Southeast Asia. The country's goal is to double its renewable energy capacity by 2013 [24].

Perspectives. Wind power is the most advanced and commercially available among RES options as well as among the cheapest and already fully competitive compared to the new installations of fossil fuel and nuclear generation for particular sites (especially for islands and isolated areas). Direct support for investment has been used to facilitate the wind market development in several European countries and the relative manufacturing industry. The CDM has acted as additional incentive for the implementation of large-scale wind projects in the developing world and more than 130 wind projects have already been registered by the CDM Executive Board, of which more than 65 are large-scale projects. Under the CDM umbrella the wind project proposers can easier access International Donors and Funds in order to achieve better than average commercial financing terms [25]. A few social acceptability barriers are expected to be overcome with the required awareness campaigns.

3.3. Solar energy

Developed world. Today, Europe is a net importer of PV cells, while PV production is growing faster in Japan. The European industry is well positioned to assume a world leadership role in the expansion of this technology. Realizing this objective requires a co-ordinated strategy incorporating both technology suppliers and users. The statistics show that while in 1994 only 20% of new capacity was grid-connected, this had grown to over 80% by 2005. The market forecast demand scenarios of annalists assume that worldwide industry revenues will reach approximately 14–17 billion € with annual PV installations between 3.2 and 3.9 GW in 2010 [26]. Southern European countries will increase their market share dramatically as a result of their current policy.

Developing world. During the recent decade, more developing regions and countries mainly in North Africa, south East Asia and South America, are taking the challenge of PV solar energy usage in remote and isolated areas such as India, Kenya, Morocco and China. Their main incentive is their desire to supply electricity for the household's basic needs, which was still lacking even at the beginning of the 21st century. In Kenya, nearly 20,000 rural households use PV solar electricity. Kenya and India remain the main notable markets, where PV sales have emerged spontaneously without governmental or other subsidies [20].

Perspectives. The investment attractiveness of solar applications vary significantly from one place to another, due of the differences in the relative availability of solar radiation, and the terms of financing for the procurement of equipment. Several EU countries are using fix feed in tariffs for PV generation in order to facilitate the wide technological deployment of PV that is expected to strive towards lowering the prices of PV installations. Solar energy technologies have a significant potential particularly appropriate for developing countries and mainly in rural, remote and isolated areas. Currently, solar electricity generation is economically competitive only where grid connection or fuel transport is difficult, costly or impossible. Examples include satellites, island communities, remote locations and ocean vessels. PV installations in buildings (e.g. roofs) for electricity generation are an environmental friendly option for decentralised electricity generation in both developed and developing countries. However, the non-existence of the required regulatory framework in most of the developing countries and the very high capital costs usually strangles the interest for this type of projects in developing countries. Programmatic CDM could play a pivotal role for the implementation of large-scale interconnected solar power exploitation installations.

3.4. Geothermal energy

Developed world. The technologies needed for geothermal power and heat production have been proven and are used by around 60 countries in the world. The potential of geothermal power generation in industrialized countries is limited to those countries that are located in volcanic areas. Within the EU, Italy has the potential to generate geothermal electricity at significant levels followed by Austria, Portugal, Iceland and France. Since 2000, geothermal generation has tripled in France and Russia [27]. Austria and Germany have been added to the list of those producing geothermal power. Assuming that the worldwide direct use growth of 50% during 1995–2000 will continue, the direct energy use production may be about 100 TWh in 2010 and 200 TWh in 2020 [28].

Developing world. The potential for power production through geothermal energy is mainly located in the 'ring of fire' around the Pacific Ocean and the rift valley in Eastern Africa [29]. Most of geothermal energy is produced in Asia when both geothermal heat and power production are taken into account. Geothermal power production has also been successfully developed in the Philippines, Mexico, Indonesia, Kenya and El Salvador [26], while Papua New Guinea has just entered the field. Countries as diverse as the

Philippines, Iceland and El Salvador generate an average of 25% of their electricity from geothermal sources and geothermal serves 30% of Tibet's energy needs [29]. Indonesia, Philippines and Mexico aim at an additional 2000 MWe before 2010 [30]. In the direct use sector, China has the most ambitious target: substitution of 13 million tons of polluting coal by geothermal energy. Recently, in El Salvador a CDM project has been set up to generate electricity from geothermal energy (La Geo project) [31].

Perspectives. The technologies needed for geothermal power and heat production have been proven and are used by many countries in the world and meets the electricity needs of some million people worldwide. However, in terms of exploration, confirmation, well drilling and field management, the technology is rather costly. Under the emerging electricity markets development, geothermal technologies and its supporting industries will face significant economic difficulties unless such installations are supported with beneficial taxation and other economic benefits.

3.5. Ocean energy

Developed world. Wave energy is a niche market, with potential for increased exploitation in the future. The wave energy potential in the EU has been estimated conservatively as 120–190 TWh per year (offshore) and 34–46 TWh per year (nearshore) [29]. The main countries involved in the development of wave power have been Denmark, Ireland, Japan, Norway, Portugal and UK [32]. A conservative estimate indicates a future wave energy market (in 2010) of approximately 5.5 TWh per year. The largest tidal facility, the La Rance station in France, has a total capacity of 240 MW. The exploitable tidal energy potential in Europe is approximately 100 TWh per year from tidal barrages (mostly in France and the UK) and around 50 TWh per year from tidal stream turbines (mostly around UK shores) [33]. Scotland is committed to cover 18% of its power needs from green sources by 2010, including 10% from a tidal generator, which is expected to replace one huge fossil fuelled power station [34].

Developing world. Wave power could in the long term make an important contribution to the world's energy demand, under the condition that is developed up to the level where it is technically and economically feasible. A potential 2000 TWh per year, or 10% of global electricity consumption [18] has been estimated, with predicted electricity costs of €0.08 kWh^{-1} [34]. India has successfully been involved in producing wave energy [32]. Three Asian countries have built (or are about to build) demonstration wave energy machines: China, India and Indonesia [35]. The energy potential of tidal basins in the developing world is large. The extraction of energy from the tides is considered to be a very promising and feasible solution in Korea, China, Mexico, Chile, Patagonian coast of Argentina and Western India [34]. The Executive Board of the CDM has now registered the first tidal CDM project (the Sihwa Tidal Power Plant, South Korea).

Perspectives. Uncertainties about the cost and technical performance of wave energy schemes, especially offshore ones, must be overcome before large-scale commercial investment can be attracted. Tidal barrages and tidal stream turbines are commercially unattractive at present and no further deployment is anticipated before 2010. Ocean energy technologies supply power continuously, rather than intermittently like solar and wind generation. On the political and public levels, the profile of wave power appears to be relatively low, with significant differences across Europe. Significant capital expenditure will be required at the outset of wave energy projects; hence fixed feed in tariffs and a secure market for electricity sales is the key to gaining the confidence of investors.

4. Conclusions

The implementation of sustainable energy technologies in the frame of CDM has to overcome many constrains. The present approach provides a "helicopter" overview of indicative RES options and their perspectives for deployment in the developing world. On a second level, it facilitates the identification of promising RES options that could be implemented in the framework of programmatic CDM.

Based on the results of the previous analysis, in general it can be noted that:

- For innovation for energy systems in a country (developed or developing) it is necessary to first of all ensure that all the stakeholders are familiar with, understand and have seen demonstration plants in their country context for RES options not currently under consideration but which have a known potential to contribute to a low carbon future and are reliable and practical.
- The risk to the investor (both national and international investors) associated with introduction of a RES options needs to be minimised, in terms of introducing the technology in an institutional or industry sector context, to create a demand and/or through governmental and international sponsored programmes of demonstration of low carbon technologies. This would provide a ready-made market which generates confidence and awareness.
- The market conditions in the developing world hampers, in many cases, the wide spread deployment of RES options, due to a number of non-technical barriers. In particular, the current single buyer form and the power tariff structure, which is characterised by heavy cross subsidies of most electricity markets in developing world is one of the main reasons reducing the financial attractiveness of RES.
- A significant perspective is to explore how sporadic CDM projects of these options will be bundled in programmatic CDM activities and how these activities will be incorporated into an integrated sustainable energy strategy for the developing countries, serving the threefold energy policy objective of security of supply, environmental protection and competitiveness.

References

[1] UNFCCC, United Nations' Framework Convention on Climate Change. FCCC/CP/2001/13/Add.1, Decision 4/CP.7, Report of the conference of parties on its seventh session, Annex. In: Seventh conference of the parties to the UNFCCC; 2002.
[2] Pablo DR. Encouraging the implementation of small renewable electricity CDM projects: an economic analysis of different options. Renewable and Sustainable Energy Reviews 2007;11:1361–87.
[3] Kirkman AM, Aalders E, Braine B, Gagnier D, editors. Greenhouse gas market 2006, financing response to climate change: moving to action. Geneva: International Emission Trading Association (IETA); 2006.
[4] Fenhann J. CDM pipeline overview. UNEP Risoe Centre; March 1, 2008. Available at http://www.cd4cdm.org.
[5] International Energy Agency (IEA). Renewable energy—market & policy trends in IEA countries. Paris: OECD/IEA; 2004.
[6] European Commission (DG XVII). The demonstration component of the Joule-Thermie Programme, Energy Technologies. Joule-Thermie Publications; 1997 .
[7] González PDR, Hernandez F, Gual M. The implications of the Kyoto project mechanisms for the deployment of renewable electricity in Europe. Energy Policy 2005;33(15):2010–22.
[8] UNFCCC, United Nations' Framework Convention on Climate Change. Synthesis report on technology needs identified by parties not included in Annex I to the convention, FCCC/SBSTA/2006/INF.1. Bonn; 2006.
[9] International Energy Agency (IEA). Energy security and climate policy: assessing interactions. Paris: OECD/IEA; 2007.
[10] Foundation Joint Implementation Network (JIN). First activity report, "ENTTRANS: the potential of transferring and implementing sustainable

energy technologies through the Clean Development Mechanism of the Kyoto Protocol" FP6 project. European Commission (EC-DG Research FP6); 2007.
[11] Oud E. The evolving context for hydropower development. Energy Policy 2002;30(14):1215–23.
[12] Taylor S, Upadhyay D, Laguna M. Flowing to the East, Small hydro in developing countries. Renewable Energy World 2006;1:126–31.
[13] Lins C, Laguna M, European Small Hydropower Association (ESHA). Development of small hydro power, examining the potential of small hydropower plants. Water Power 2002.
[14] Hicks C. Small hydropower in China: a new record in world hydropower development. Refocus 2004;5(6):36–40.
[15] Paish O. Small hydro power: technology and current status. Renewable and Sustainable Energy Reviews 2002;6(6):537–56.
[16] Taylor SDB, Upadhyay D. Sustainable markets for small hydro in developing countries. International Journal on Hydropower & Dams 2005;12(3):62–7.
[17] Bartle A. Hydropower potential and development activities. Energy Policy 2002;30:1231–9.
[18] World Energy Council (WEC). Survey of energy resources 2007. London: WEC; 2007.
[19] Iniyan S, Sumathy K. The application of a Delphi technique in the linear programming optimization of future renewable energy options for India. Biomass and Bioenergy 2003;24(1):39–50.
[20] International Energy Agency (IEA). Renewables in global energy supply, an IEA fact sheet. Paris: OECD/IEA; 2007.
[21] Joselin Herbert GM, Iniyan S, Sreevalsan E, Rajapandian S. A review of wind energy technologies. Renewable and Sustainable Energy Reviews 2007;11: 1117–45.
[22] Baroudi JA, Dinavahi V, Knight AM. A review of power converter topologies for wind generators. Renewable Energy 2007;32(14):2369–85.
[23] Jobert A, Laborgne P, Mimler S. Local acceptance of wind energy: factors of success identified in French and German case studies. Energy Policy 2007;35: 2751–60.
[24] Martinot E, Chaurey A, Lew D, Moreira JR, Wamukonya N. Renewable energy markets in developing countries. Annual Review of Energy and the Environment 2002;27:309–48.
[25] Georgiou P, Tourkolias C, Diakoulaki D. A roadmap for selecting host countries of wind energy projects in the framework of the clean development mechanism. Renewable and Sustainable Energy Reviews 2008;12:712–31.
[26] World Bank Independent Evaluation Group (IEG). New renewable energy, a review of the World Bank's assistance. Washington, DC: IEG World Bank; 2006
[27] Michaelowa A, Jotzo F. Transaction costs, institutional rigidities and the size of the clean development mechanism. Energy Policy 2005;33:511–23.
[28] Lund JW, Freeston DH, Boyd TL. Direct application of geothermal energy: 2005 Worldwide review. Geothermics 2005;34:691–727.
[29] Renewable Energy Policy Network for the 21st Century (REN21). Renewables, global status report 2006 update. REN21; 2006.
[30] Bertani R. World geothermal power generation in the period 2001–2005. Geothermics 2005;34:651–90.
[31] Abraham J. Investment prospects for geothermal power in El Salvador's electricity market. Energy Policy 2006;34:3877–86.
[32] Henfridsson U, Neimane V, Strand K, Kapper R, Bernhoff H, Danielsson O, et al. Wave energy potential in the Baltic Sea and the Danish part of the North Sea, with reflections on the Skagerrak. Renewable Energy 2007;32(12):2069–84.
[33] Bernhoff H, Sjostedt E, Leijon M. Technical note: wave energy resources in sheltered sea areas: a case study of the Baltic Sea. Renewable Energy 2006;31:2164–70.
[34] Agamloh EB, Wallace AK, Jouanne A. Application of fluid–structure interaction simulation of an ocean wave energy extraction device. Renewable Energy 2008;33:748–57.
[35] Johnstone CM, Nielsen K, Lewis T, Sarmento A, Lemonis G. EC FPVI co-ordinated action on ocean energy: a European platform for sharing technical information and research outcomes in wave and tidal energy systems. Renewable Energy 2006;31(2):191–6.